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LAKE LOU YAEGER, MONTGOMERY COUNTY, ILLINOIS

Pacific Northwest Environmental Research Laboratory

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16. ABSTRACT
Annual total phosphorus and total nitrogen loadings to the lake were estimated and subdivded according to either point or non-point source origin. An assessment of the lake's trophic condition and limiting nutrient is also provided. All data collected by the U.S.E.P.A. National Eutrophication Survey during the one year study of the lake and its tributaries are included in the report.

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NATIONAL EUTROPHICATION SURVEY

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REPORT
ON
LAKE LOU YAEGER
MONTGOMERY COUNTY
ILLINOIS
EPA REGION V
WORKING PAPER No. 310

WITH THE COOPERATION OF THE
ILLINOIS EVNRIONMENTAL PROTECTION AGENCY
AND THE
ILLINOIS NATIONAL GUARD
JUNE, 1975

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FOREWORD

The National Eutrophication Survey was initiated in 1972 in response to an Administration commitment to investigate the nationwide threat of accelerated eutrophication to fresh water lakes and reservoirs.

OBJECTIVES

The Survey was designed to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations, and impact on selected freshwater lakes as a basis for formulating comprehensive and coordinated national, regional, and state management practices relating to point-source discharge reduction and non-point source pollution abatement in lake watersheds.

ANALYTIC APPROACH

The mathematical and statistical procedures selected for the Survey's eutrophication analysis are based on related concepts that:

a. A generalized representation or model relating sources, concentrations, and impacts can be constructed.

b. By applying measurements of relevant parameters associated with lake degradation, the generalized model can be transformed into an operational representation of a lake, its drainage basin, and related nutrients.

c. With such a transformation, an assessment of the potential for eutrophication control can be made.

LAKE ANALYSIS

In this report, the first stage of evaluation of lake and watershed data collected from the study lake and its drainage basin is documented. The report is formatted to provide state environmental agencies with specific information for basin planning [§303(e)], water quality criteria/standards review [§303(c)], clean lakes [§314(a,b)], and water quality monitoring [§106 and §305(b)] activities mandated by the Federal Water Pollution Control Act Amendments of 1972.

Beyond the single lake analysis, broader based correlations between nutrient concentrations (and loading) and trophic condition are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's fresh water lakes. Likewise, multivariate evaluations for the relationships between land use, nutrient export, and trophic condition, by lake class or use, are being developed to assist in the formulation of planning guidelines and policies by EPA and to augment plans implementation by the states.

ACKNOWLEDGMENT

The staff of the National Eutrophication Survey (Office of Research & Development, U. S. Environmental Protection Agency) expresses sincere appreciation to the Illinois Environmental Protection Agency for professional involvement and to the Illinois National Guard for conducting the tributary sampling phase of the Survey.

Dr. Richard H. Briceland, Director of the Illinois Environmental Protection Agency; and Ronald M. Barganz, State Survey Coordinator, and John J. Forneris, Manager of Region III, Field Operations Section of the Division of Water Pollution Control, provided invaluable lake documentation and counsel during the Survey, reviewed the preliminary reports, and provided critiques most useful in the preparation of this Working Paper series.

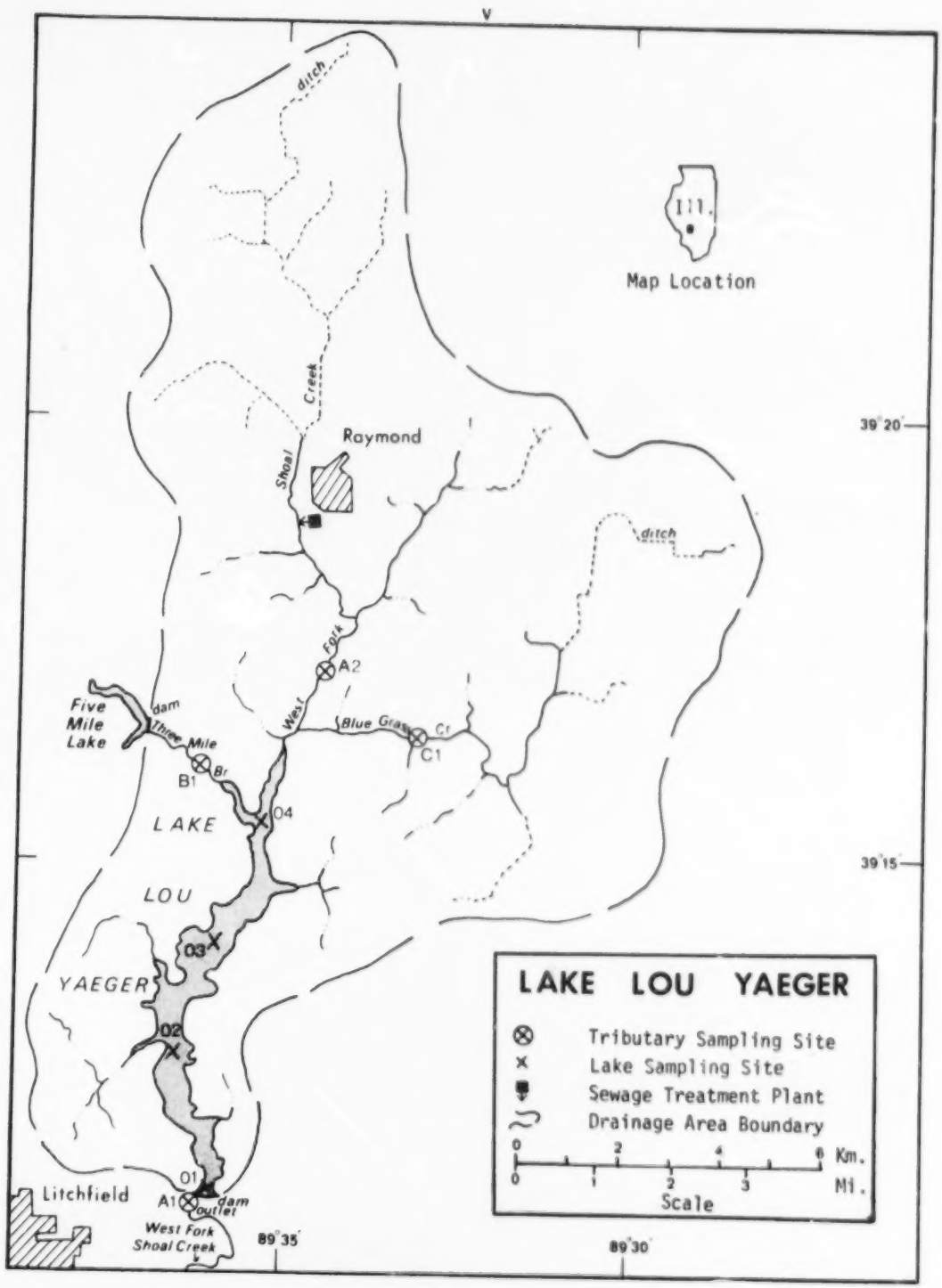
Major General Harold R. Patton, the Adjutant General of Illinois, and Project Officer Colonel Daniel L. Fane, who directed the volunteer efforts of the Illinois National Guardsmen, are also gratefully acknowledged for their assistance to the Survey.

NATIONAL EUTROPHICATION SURVEY

STUDY LAKES

STATE OF ILLINOIS

LAKE NAME	COUNTY
Baldwin	Randolph
Bloomington	McLean
Carlyle	Bond, Clinton, Fayette
Cedar	Lake
Charleston	Coles
Coffeen	Montgomery
Crab Orchard	Jackson, Williamson
Decatur	Macon
DePue	Bureau
East Loon	Lake
Fox	Lake
Grass	Lake
Highland Silver	Madison
Holiday	LaSalle
Horseshoe	Madison
Long	Lake
Lou Yaeger	Montgomery
Marie	Lake
Old Ben Mine	Franklin
Pistakee	Lake, McHenry
Raccoon	Marion
Rend	Franklin, Jefferson
Sangchris	Christian
Shelbyville	Moultrie, Shelby
Slocum	Lake
Springfield	Sangamon
Storey	Knox
Vandalia	Fayette
Vermilion	Vermilion
Wee Ma Tuk	Fulton
Wonder	McHenry


Ill.
Map Location
ditch
Shoal Creek
Raymond
39°20'
ditch
West Fork
A2
Five Mile Lake
dam
Three Mile Br
B1
Blue Grass Cr
C1
LAKE
LOU
YAEGER
O4
O3
O2
O1
A1
dam outlet
Litchfield
West Fork Shoal Creek
89°35'
89°30'
39°15'
LAKE LOU YAEGER
Tributary Sampling Site
Lake Sampling Site
Sewage Treatment Plant
Drainage Area Boundary
0 2 4 6 Km.
0 1 2 3 Mi.
Scale

LAKE LOU YAEGER

STORET NO. 1726

I. CONCLUSIONS

A. Trophic Condition:

Survey data indicate that Lake Lou Yaeger is eutrophic. It ranked 21st when the 31 Illinois lakes sampled in 1973 were compared using a combination of six parameters*. Twenty-one lakes had less median total phosphorus, 23 had less median dissolved phosphorus, 19 had less median inorganic nitrogen, but only four had less mean chlorophyll a. The relatively low mean chlorophyll a and the high nutrient levels indicate primary productivity probably was light-limited. Twenty-eight of the lakes had greater mean Secchi disc transparency, and Survey limnologists noted that the lake was very turbid at all sampling times.

B. Rate-Limiting Nutrient:

The algal assay results are not considered representative of conditions in the lake because of a significant change in nutrient concentrations in the sample between the time of collection and the beginning of the assay.

However, the lake data indicate phosphorus was the limiting nutrient at all sampling times.

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* See Appendix A.

C. Nutrient Controllability:

1. Point sources--The phosphorus load from the only known point source, the Village of Raymond, amounted to 5.5% of the total reaching the lake during the sampling year. The present phosphorus loading rate of 3.15 $g/m^2/yr$ is a little over five times that proposed by Vollenweider (Vollenweider and Dillon, 1974) as a eutrophic rate (see page 12). Even complete removal of phosphorus at Raymond would still leave a loading rate nearly five times the eutrophic rate, and it appears that point-source phosphorus control would not appreciably improve the trophic condition of Lake Lou Yaeger.

2. Non-point sources--The three gaged tributaries, Three Mile Creek (37.6%), West Fork, Shoal Creek (29.9%), and Blue Grass Creek (10.7%), contributed a total of 78.2% of the annual non-point phosphorus load. The ungaged drainage areas were estimated to have contributed 15.8%.

The phosphorus export rates of the three tributaries ranged from 39 to 73 $kg/km^2/yr$ with a mean of 61 $kg/km^2/yr$ (see page 12). Two of the three tributaries have export rates that appear to be somewhat high compared to the rates of four unimpacted tributaries of nearby Lake Vandalia* (mean = 42 $kg/km^2/yr$; range of 34 to 58 $kg/km^2/yr$), but this may be due to differences in land-use practices in the two lake drainages.

* Working Paper No. 319.

II. LAKE AND DRAINAGE BASIN CHARACTERISTICS†

A. Lake Morphometry††:

1. Surface area: 5.72 kilometers^2.
2. Mean depth: 3.3 meters.
3. Maximum depth: >6.7 meters.
4. Volume: 18.876 x 10^6 m^3.
5. Mean hydraulic retention time: 121 days.

B. Tributary and Outlet:
(See Appendix C for flow data)

1. Tributaries -

Name	Drainage area (km^2)*	Mean flow (m^3/sec)*
Three Mile Branch	97.4	0.6
West Fk., Shoal Creek	74.3	0.5
Blue Grass Creek	50.0	0.3
Minor tributaries & immediate drainage -	52.3	0.4
Totals	274.0	1.8

2. Outlet -

West Fk., Shoal Creek	279.7**	1.8

C. Precipitation***:

1. Year of sampling: 127.8 centimeters.
2. Mean annual: 94.8 centimeters.

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† Table of metric conversions--Appendix B.
†† Forneris, 1973.
* For limits of accuracy, see Working Paper No. 175, "...Survey Methods, 1973-1976".
** Includes area of lake.
*** See Working Paper No. 175.

III. LAKE WATER QUALITY SUMMARY

Lake Lou Yaeger was sampled three times during the open-water season of 1973 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from four stations on the lake and from a number of depths at each station (see map, page v). During each visit, a single depth-integrated (4.6 m or near bottom to surface) sample was composited from the stations for phytoplankton identification and enumeration; and during the first visit, a single 18.9-liter depth-integrated sample was composited for algal assays. Also each time, a depth-integrated sample was collected from each of the stations for chlorophyll a analysis. The maximum depths sampled were 6.7 meters at station 1, 6.7 meters at station 2, 3.0 meters at station 3, and 2.4 meters at station 4.

The lake sampling results are presented in full in Appendix D and are summarized in the following table.

A. SUMMARY OF PHYSICAL AND CHEMICAL CHARACTERISTICS FOR LAKE LOU YAEGER
STORET CODE 1726

PARAMETER	1ST SAMPLING (5/12/73) 4 SITES RANGE	MEAN	MEDIAN	2ND SAMPLING (8/10/73) 4 SITES RANGE	MEAN	MEDIAN	3RD SAMPLING (10/18/73) 4 SITES RANGE	MEAN	MEDIAN
TEMP (C)	16.5 - 19.1	18.0	18.0	20.4 - 28.6	26.1	26.7	15.8 - 18.7	17.6	18.1
DISS OXY (MG/L)	5.8 - 9.6	7.5	7.6	3.6 - 6.2	5.1	5.0	7.0 - 8.0	7.4	7.3
CNDCTVY (MCROMO)	170. - 340.	212.	180.	194. - 238.	209.	203.	166. - 310.	200.	174.
PH (STAND UNITS)	7.6 - 7.8	7.7	7.7	6.9 - 8.2	7.3	7.3	7.4 - 7.9	7.6	7.6
TOT ALK (MG/L)	39. - 88.	55.	46.	62. - 81.	68.	64.	61. - 121.	73.	65.
TOT P (MG/L)	0.252 - 0.334	0.291	0.288	0.166 - 0.230	0.195	0.184	0.124 - 0.172	0.150	0.150
ORTHO P (MG/L)	0.089 - 0.139	0.106	0.097	0.035 - 0.088	0.069	0.074	0.055 - 0.077	0.067	0.067
NO2+NO3 (MG/L)	1.230 - 3.600	1.961	1.565	0.840 - 1.760	1.498	1.640	0.830 - 1.920	1.029	0.840
AMMONIA (MG/L)	0.110 - 0.330	0.182	0.140	0.060 - 0.330	0.132	0.080	0.050 - 0.080	0.058	0.050
KJEL N (MG/L)	0.600 - 1.300	0.767	0.700	0.700 - 1.200	0.927	0.900	0.600 - 0.900	0.709	0.700
INORG N (MG/L)	1.380 - 3.910	2.142	1.685	1.170 - 1.840	1.630	1.740	0.880 - 2.000	1.087	0.900
TOTAL N (MG/L)	1.830 - 4.900	2.727	2.265	2.040 - 2.760	2.425	2.380	1.430 - 2.820	1.738	1.530
CHLRPYL A (UG/L)	****** -**********			0.8 - 46.7	12.7	1.7	4.2 - 16.2	8.6	6.9
SECCHI (METERS)	0.1 - 0.2	0.1	0.2	0.2 - 0.3	0.2	0.2	0.4 - 0.5	0.4	0.4

B. Biological characteristics:

1. Phytoplankton -

Sampling Date	Dominant Genera	Algal Units per ml
05/13/73	1. Cryptomonas sp.	20
	2. Synedra sp.	20
	3. Nitzschia sp.	20
	4. Flagellates	20
	5. Pennate diatoms	20
	Total	100
08/10/73	1. Stephanodiscus sp.	94
	2. Pennate diatoms	78
	3. Cyclotella sp.	47
	4. Trachelomonas sp.	16
	5. Melosira sp.	16
	Other genera	15
	Total	266
10/18/73	1. Melosira sp.	706
	2. Cyclotella sp.	196
	3. Stephanodiscus sp.	144
	4. Coelastrum sp.	13
	5. Euglena sp.	13
	Other genera	118
	Total	1,190

2. Chlorophyll *a* -

Sampling Date	Station Number	Chlorophyll *a* (µg/l)
05/12/73*		
08/10/73	01	0.8
	02	1.1
	03	2.4
	04	46.7
10/18/73	01	4.2
	02	5.1
	03	8.8
	04	16.2

C. Limiting Nutrient Study:

There was more than a 30% change in nutrient levels in the assay sample from the time of collection to the beginning of the assay, and the results are not representative of conditions in the lake at the time the sample was collected.

The lake data indicate phosphorus limitation at all sampling times, i.e., the mean inorganic nitrogen/orthophosphorus ratios were 16/1 or greater, and phosphorus limitation would be expected.

* Samples lost in shipment.

IV. NUTRIENT LOADINGS
(See Appendix E for data)

For the determination of nutrient loadings, the Illinois National Guard collected monthly near-surface grab samples from each of the tributary sites indicated on the map (page v), except for the high runoff month of March when two samples were collected. Sampling was begun in June, 1973, and was completed in May, 1974.

Through an interagency agreement, stream flow estimates for the year of sampling and a "normalized" or average year were provided by the Illinois District Office of the U.S. Geological Survey for the tributary sites nearest the lake.

In this report, nutrient loads for sampled tributaries were determined by using a modification of a U.S. Geological Survey computer program for calculating stream loadings*. Nutrient loads shown are those measured minus point-source loads, if any.

Nutrient loads for unsampled "minor tributaries and immediate drainage" ("ZZ" of U.S.G.S.) were estimated using the means of the nutrient loads, in kg/km^2/year, at stations B-1 and C-1 and multiplying the means by the ZZ area in km^2.

The Village of Raymond did not participate in the Survey, and nutrient loads were estimated at 1.134 kg P and 3.401 kg N/capita/year.

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* See Working Paper No. 175.

A. Waste Sources:

1. Known muncipal* -

Name	Pop. Served	Treatment	Mean Flow (m^3/d)	Receiving Water
Raymond	870	trickling filter	329.3**	Shoal Creek

2. Known industrial - None

* Anonymous, 1972.
** Estimated at 0.3785 m^3/capita/day.

B. Annual Total Phosphorus Loading - Average Year:

1. Inputs -

Source	kg P/ yr	% of total
a. Tributaries (non-point load) -		
Three Mile Branch	6,775	37.6
West Fk., Shoal Creek	5,395	29.9
Blue Grass Creek	1,930	10.7
b. Minor tributaries & immediate drainage (non-point load) -	2,850	15.8
c. Known municipal STP's -		
Raymond	985	5.5
d. Septic tanks - Unknown	-	-
e. Known industrial - None	-	-
f. Direct precipitation* -	100	0.5
Total	18,035	100.0

2. Outputs -

Lake outlet - West Fk., Shoal Creek	16,025

3. Net annual P accumulation - 2,010 kg.

* See Working Paper No. 175.

C. Annual Total Nitrogen Loading - Average Year:

1. Inputs -

Source	kg N/ yr	% of total
a. Tributaries (non-point load) -		
Three Mile Branch	63,955	24.0
W. Fk., Shoal Creek	77,920	29.2
Blue Grass Creek	64,640	24.3
b. Minor tributaries & immediate drainage (non-point load) -	50,990	19.1
c. Known municipal STP's -		
Raymond	2,960	1.1
d. Septic tanks - Unknown	-	-
e. Known industrial - None	-	-
f. Direct precipitation* -	6,165	2.3
Total	266,630	100.0

2. Outputs -

Lake outlet - West Fk., Shoal Creek	173,835

3. Net annual N accumulation - 92,795 kg.

* See Working Paper No. 175.

D. Mean Annual Non-point Nutrient Export by Subdrainage Area:

Tributary	kg P/km²/yr	kg N/km²/yr
Three Mile Branch	70	657
West Fk., Shoal Creek	73	1,049
Blue Grass Creek	39	1,293

E. Yearly Loading Rates:

In the following table, the existing phosphorus loading rates are compared to those proposed by Vollenweider (Vollenweider and Dillon, 1974). Essentially, his "dangerous" rate is the rate at which the receiving water would become eutrophic or remain eutrophic; his "permissible" rate is that which would result in the receiving water remaining oligotrophic or becoming oligotrophic if morphometry permitted. A mesotrophic rate would be considered one between "dangerous" and "permissible".

Note that Vollenweider's model may not be applicable to water bodies with short hydraulic retention times.

	Total Phosphorus		Total Nitrogen	
	Total	Accumulated	Total	Accumulated
grams/m²/yr	3.15	0.35	46.6	16.2

Vollenweider loading rates for phosphorus (g/m²/yr) based on mean depth and mean hydraulic retention time of Lake Lou Yaeger:

"Dangerous" (eutrophic rate)	0.62
"Permissible" (oligotrophic rate)	0.31

V. LITERATURE REVIEWED

Anonymous, 1972. Wastewater treatment work data book. IL Env. Prot. Agency, Springfield.

Forneris, John J., 1973. Personal communication (lake morphometry). IL Env. Prot. Agency, Springfield.

Vollenweider, R. A., and P. J. Dillon, 1974. The application of the phosphorus loading concept to eutrophication research. Natl. Res. Council of Canada Publ. No. 13690, Canada Centre for Inland Waters, Burlington, Ontario.

VI. APPENDICES

APPENDIX A

LAKE RANKINGS

LAKE DATA TO BE USED IN RANKINGS

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS ORTHO P
1703	LAKE BLOOMINGTON	0.050	5.730	484.667	26.200	14.800	0.020
1706	LAKE CARLYLE	0.084	1.270	477.889	17.367	11.000	0.032
1708	LAKE CHARLESTON	0.160	4.680	490.667	12.000	8.400	0.065
1711	COFFEEN LAKE	0.032	0.260	456.222	7.700	14.900	0.012
1712	CRAB ORCHARD LAKE	0.082	0.290	482.222	59.867	13.800	0.013
1714	LAKE DECATUR	0.124	3.750	474.571	43.000	14.500	0.062
1725	LONG LAKE	0.704	1.190	482.667	49.333	6.800	0.398
1726	LAKE LOU YA[illegible]	0.186	1.680	489.583	10.662	11.400	0.076
1727	LAKE MARIE	0.098	0.370	467.667	39.533	14.700	0.057
1733	PISTAKEE LAKE	0.203	0.370	485.667	75.867	7.000	0.062
1735	REND LAKE	0.071	0.210	471.500	23.533	12.700	0.012
1739	LAKE SHELBYVILLE	0.062	3.290	461.333	17.161	14.800	0.019
1740	SILVER LAKE (HIGHLAND)	0.226	0.970	484.500	5.822	14.800	0.057
1742	LAKE SPRINGFIELD	0.104	3.265	483.385	13.013	10.800	0.059
1748	VERMILION LAKE	0.109	4.695	481.500	31.150	14.200	0.050
1750	WONDER LAKE	0.426	0.890	486.000	98.533	7.800	0.132
1751	LAKE STORY	0.072	2.510	459.333	17.250	14.800	0.021
1752	DEPUE LAKE	0.438	4.850	490.000	58.833	7.600	0.276
1753	LAKE SANGCHRIS	0.050	1.970	475.417	19.292	14.500	0.009
1754	LAKE HOLIDAY	0.167	3.135	485.167	51.217	7.200	0.046
1755	FOX LAKE	0.214	0.375	486.167	63.850	8.800	0.083
1756	GRASS LAKE	0.301	0.820	481.000	83.500	5.900	0.093
1757	EAST LOON LAKE	0.076	0.120	450.000	22.300	14.900	0.014
1758	SLOCUM LAKE	0.865	0.200	487.333	221.100	5.800	0.362
1759	CEDAR LAKE	0.029	0.170	400.333	5.767	12.800	0.013
1761	LAKE WEMATUK	0.069	1.770	466.333	7.967	14.500	0.031
1762	RACCOON LAKE	0.106	0.310	484.333	19.217	13.800	0.020
1763	BALDWIN LAKE	0.044	0.140	461.167	11.333	13.200	0.007

LAKE DATA TO BE USED IN RANKINGS

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS ORTHO P
1764	LAKE VANDALIA	0.116	0.480	478.111	11.276	14.800	0.023
1765	OLD BEN MINE RESERVOIR	0.930	0.205	478.333	31.433	11.200	0.575
1766	HORSESHOE LAKE	0.127	0.705	482.833	182.250	6.600	0.018

PERCENT OF LAKES WITH HIGHER VALUES (NUMBER OF LAKES WITH HIGHER VALUES)

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS ORTHO P	INDEX NO
1703	LAKE BLOOMINGTON	88 (26)	0 (0)	80 (24)	47 (14)	13 (2)	68 (20)	296
1706	LAKE CARLYLE	63 (19)	40 (12)	63 (19)	63 (19)	63 (19)	53 (16)	345
1708	LAKE CHARLESTON	37 (11)	7 (2)	0 (0)	77 (23)	77 (23)	27 (8)	225
1711	COFFEEN LAKE	97 (29)	77 (23)	[illegible] (28)	93 (28)	2 (0)	92 (27)	454
1712	CRAB ORCHARD LAKE	67 (20)	90 (27)	43 (13)	20 (6)	42 (12)	85 (25)	347
1714	LAKE DECATUR	40 (12)	13 (4)	53 (16)	33 (10)	30 (8)	32 (9)	201
1725	LONG LAKE	7 (2)	43 (13)	40 (12)	30 (9)	72 (21)	3 (1)	195
1726	LAKE LOU YAEGER	30 (9)	37 (11)	7 (2)	87 (26)	57 (17)	23 (7)	241
1727	LAKE MARIE	60 (18)	68 (20)	73 (22)	37 (11)	23 (7)	42 (12)	303
1733	PISTAKEE LAKE	27 (8)	68 (20)	23 (7)	13 (4)	90 (27)	32 (9)	253
1735	RENO LAKE	77 (23)	80 (24)	70 (21)	50 (15)	53 (16)	92 (27)	422
1739	LAKE SHELBYVILLE	83 (25)	17 (5)	83 (25)	70 (21)	13 (2)	73 (22)	339
1740	SILVER LAKE (HIGHLAND)	20 (6)	47 (14)	10 (3)	97 (29)	13 (2)	42 (12)	229
1742	LAKE SPRINGFIELD	53 (16)	20 (6)	33 (10)	73 (22)	67 (20)	37 (11)	283
1748	VERMILION LAKE	50 (15)	3 (1)	47 (14)	43 (13)	37 (11)	47 (14)	227
1750	WONDER LAKE	13 (4)	50 (15)	20 (6)	7 (2)	80 (24)	13 (4)	183
1751	LAKE STORY	73 (22)	27 (8)	90 (27)	67 (20)	13 (2)	63 (19)	333
1752	DEPUE LAKE	10 (3)	10 (3)	3 (1)	23 (7)	83 (25)	10 (3)	139
1753	LAKE SANGCHRIS	88 (26)	30 (9)	67 (20)	57 (17)	30 (8)	97 (29)	369
1754	LAKE HOLIDAY	33 (10)	23 (7)	27 (8)	27 (8)	87 (26)	50 (15)	247
1755	FOX LAKE	23 (7)	63 (19)	17 (5)	17 (5)	72 (21)	20 (6)	212
1756	GRASS LAKE	17 (5)	53 (16)	50 (15)	10 (3)	97 (29)	17 (5)	244
1757	EAST LOON LAKE	70 (21)	100 (30)	97 (29)	53 (16)	2 (0)	77 (23)	399
1758	SLOCUM LAKE	3 (1)	87 (26)	13 (4)	0 (0)	100 (30)	7 (2)	210
1759	CEDAR LAKE	100 (30)	93 (28)	100 (30)	100 (30)	50 (15)	85 (25)	528
1761	LAKE HEMATUR	80 (24)	33 (10)	77 (23)	90 (27)	30 (8)	57 (17)	367
1762	RACCOON LAKE	57 (17)	73 (22)	30 (9)	60 (18)	42 (12)	68 (20)	330
1763	BALDWIN LAKE	93 (28)	97 (29)	87 (26)	80 (24)	47 (14)	100 (30)	504

PERCENT OF LAKES WITH HIGHER VALUES (NUMBER OF LAKES WITH HIGHER VALUES)

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS ORTHO P	INDEX NO
1764	LAKE VANDALIA	47 (14)	60 (18)	60 (18)	83 (25)	13 (2)	60 (18)	323
1765	OLD BEN MINE RESERVOIR	0 (0)	83 (25)	57 (17)	40 (12)	60 (18)	0 (0)	240
1766	HORSESHOE LAKE	43 (13)	57 (17)	37 (11)	3 (1)	93 (28)	80 (24)	313

LAKES RANKED BY INDEX NOS.

RANK	LAKE CODE	LAKE NAME	INDEX NO
1	1759	CEDAR LAKE	528
2	1763	BALDWIN LAKE	504
3	1711	COFFEEN LAKE	454
4	1735	REND LAKE	422
5	1757	EAST LOON LAKE	399
6	1753	LAKE SANGCHRIS	369
7	1761	LAKE WEMATUK	367
8	1712	CRAB ORCHARD LAKE	347
9	1706	LAKE CARLYLE	345
10	1739	LAKE SHELBYVILLE	339
11	1751	LAKE STORY	333
12	1762	RACCOON LAKE	330
13	1764	LAKE VANDALIA	323
14	1766	HORSESHOE LAKE	313
15	1727	LAKE MARIE	303
16	1703	LAKE BLOOMINGTON	296
17	1742	LAKE SPRINGFIELD	283
18	1733	PISTAKEE LAKE	253
19	1754	LAKE HOLIDAY	247
20	1756	GRASS LAKE	244
21	1726	LAKE LOU YAEGER	241
22	1765	OLD BEN MINE RESERVOIR	240
23	1740	SILVER LAKE (HIGHLAND)	229
24	1748	VERMILION LAKE	227
25	1708	LAKE CHARLESTON	225
26	1755	FOX LAKE	212
27	1758	SLOCUM LAKE	210
28	1714	LAKE DECATUR	201

LAKES RANKED BY INDEX NOS.

RANK	LAKE CODE	LAKE NAME	INDEX NO
29	1725	LONG LAKE	195
30	1750	WONDER LAKE	183
31	1752	DEPUE LAKE	139

APPENDIX B

CONVERSIONS FACTORS

CONVERSION FACTORS

Hectares x 2.471 = acres

Kilometers x 0.6214 = miles

Meters x 3.281 = feet

Cubic meters x 8.107×10^{-4} = acre/feet

Square kilometers x 0.3861 = square miles

Cubic meters/sec x 35.315 = cubic feet/sec

Centimeters x 0.3937 = inches

Kilograms x 2.205 = pounds

Kilograms/square kilometer x 5.711 = lbs/square mile

APPENDIX C

TRIBUTARY FLOW DATA

TRIBUTARY FLOW INFORMATION FOR ILLINOIS 10/23/75

LAKE CODE 1726 LAKE LOU YEAGER

TOTAL DRAINAGE AREA OF LAKE(SQ KM) 279.7

TRIBUTARY	SUB-DRAINAGE AREA(SQ KM)	NORMALIZED FLOWS(CMS) JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
1726A1	279.7	1.87	2.71	3.43	3.54	2.78	2.30	1.41	0.74	0.53	0.60	0.86	1.02	1.81
1726A2	74.3	0.47	0.72	0.88	0.91	0.71	0.60	0.36	0.19	0.13	0.14	0.21	0.25	0.46
1726B1	97.4	0.62	0.94	1.16	1.20	0.94	0.79	0.48	0.25	0.17	0.19	0.28	0.33	0.61
1726C1	50.0	0.31	0.48	0.59	0.61	0.47	0.40	0.24	0.12	0.08	0.09	0.14	0.16	0.31
1726Z2	58.0	0.47	0.57	0.79	0.83	0.65	0.50	0.34	0.18	0.15	0.19	0.24	0.28	0.43

SUMMARY

TOTAL DRAINAGE AREA OF LAKE = 279.7
SUM OF SUB-DRAINAGE AREAS = 279.7
TOTAL FLOW IN = 21.78
TOTAL FLOW OUT = 21.78

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
1726A1	6	73	9.32	2	0.85				
	7	73	3.37	8	1.27				
	8	73	4.16	4	0.15				
	9	73	0.42	8	0.34				
	10	73	0.57	13	0.34				
	11	73	2.41	4	0.65				
	12	73	9.00	2	1.95				
	1	74	17.19	5	1.44				
	2	74	7.31	17	0.82				
	3	74	10.34	2	4.05	16	4.22		
	4	74	4.81	6	2.24				
	5	74	6.77	5	0.54				
1726A2	6	73	2.44	2	0.22				
	7	73	0.85	8	0.34				
	8	73	1.05	4	0.04				
	9	73	0.10	8	0.08				
	10	73	0.13	13	0.08				
	11	73	0.59	4	0.16				
	12	73	2.21	2	0.48				
	1	74	4.30	5	0.37				
	2	74	1.93	17	0.22				
	3	74	2.66	2	1.05	16	1.08		
	4	74	1.25	6	0.57				
	5	74	1.76	5	0.14				

TRIBUTARY FLOW INFORMATION FOR ILLINOIS 10/23/75

LAKE CODE 1726 LAKE LOU YEAGER

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
172681	6	73	3.23	2	0.28				
	7	73	1.13	8	0.42				
	8	73	1.39	4	0.05				
	9	73	0.14	8	0.11				
	10	73	0.18	13	0.10				
	11	73	0.79	4	0.21				
	12	73	2.97	2	0.65				
	1	74	5.72	5	0.48				
	2	74	2.55	17	0.28				
	3	74	3.51	2	1.36	16	1.44		
	4	74	1.64	6	0.76				
	5	74	2.29	5	0.18				
1726C1	6	73	1.64	2	0.15				
	7	73	0.57	8	0.22				
	8	73	0.68	4	0.03				
	9	73	0.07	8	0.05				
	10	73	0.08	13	0.05				
	11	73	0.37	4	0.10				
	12	73	1.47	2	0.31				
	1	74	2.83	5	0.24				
	2	74	1.30	17	0.14				
	3	74	1.78	2	0.71	16	0.74		
	4	74	0.82	6	0.37				
	5	74	1.16	5	0.09				
172622	6	73	2.01	2	1.93				
	7	73	0.82	8	0.28				
	8	73	1.05	4	0.04				
	9	73	0.12	8	0.09				
	10	73	0.28	13	0.11				
	11	73	0.65	4	0.18				
	12	73	2.35	2	0.51				
	1	74	4.33	5	0.34				
	2	74	1.53	17	0.18				
	3	74	2.38	2	0.93	16	0.96		
	4	74	1.10	6	0.54				
	5	74	1.56	5	0.13				

APPENDIX D

PHYSICAL and CHEMICAL DATA

STORET RETRIEVAL DATE 75/10/23

172601
39 11 15.0 089 35 58.0
LAKE LOU YAEGER
17135 ILLINOIS

11EPALES
3

2111202
0025 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/05/12	09 55	0000	18.1		4	175	7.70	40	0.130	0.800	1.480	0.101
	09 55	0006	18.0	8.0		170	7.70	40	0.130	0.700	1.370	0.096
	09 55	0015	17.9	7.7		170	7.60	39	0.140	0.700	1.450	0.096
	09 55	0021	16.5	6.8		180	7.60	39	0.130	0.700	1.820	0.089
73/08/10	13 45	0000	27.2		10	203	7.30	64	0.080	1.000	1.760	0.084
	13 45	0005	25.8	5.0		199	7.30	63	0.060	0.900	1.740	0.088
	13 45	0015	25.4	4.6		198	7.00	70	0.220	0.900	1.390	0.067
	13 45	0020	20.4	5.0		194	6.90	81	0.330	1.200	0.840	0.058
73/10/18	10 33	0000	18.6		15	168	7.60	63	0.050	0.600	0.830	0.062
	10 33	0015	18.4	7.0		166	7.60	64	0.050	0.600	0.830	0.064
	10 33	0022	18.3	7.0		167	7.50	67	0.060	0.700	0.830	0.067

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/05/12	09 55	0000	0.300	
	09 55	0006	0.281	
	09 55	0015	0.295	
	09 55	0021	0.278	
73/08/10	13 45	0000	0.211	0.8
	13 45	0005	0.189	
	13 45	0015	0.184	
	13 45	0020	0.230	
73/10/18	10 33	0000	0.137	4.2
	10 33	0015	0.124	
	10 33	0022	0.144	

STORET RETRIEVAL DATE 75/10/23

172602
39 12 45.0 089 36 28.0
LAKE LOU YAEGER
17135 ILLINOIS

11EPALES
3

2111202
0019 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/05/12	10 15	0000	17.0		6	186	7.70	45	0.140	0.800	1.390	0.100
	10 15	0006	17.0	7.5		180	7.70	46	0.110	0.600	1.650	0.098
	10 15	0015	16.7	6.9		180	7.70	45	0.130	0.600	1.250	0.094
73/08/10	13 25	0000	27.3		10	205	7.40	62	0.060	0.700	1.760	0.083
	13 25	0005	26.5	6.0		203	7.30	63	0.060	0.700	1.640	0.080
	13 25	0012	25.7	3.6		201	7.10	65	0.070	0.900	1.740	0.074
73/10/14	10 15	0000	18.7		16	171	7.50	61	0.050	0.700	0.830	0.065
	10 15	0015	18.1	7.3		171	7.50	61	0.050	0.600	0.830	0.063
	10 15	0022	18.1	7.0		174	7.40	64	0.060	0.600	0.840	0.069

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/05/12	10 15	0000	0.286	
	10 15	0006	0.291	
	10 15	0015	0.326	
73/08/10	13 25	0000	0.184	1.1
	13 25	0005	0.182	
	13 25	0012	0.184	
73/10/14	10 15	0000	0.146	5.1
	10 15	0015	0.150	
	10 15	0022	0.150	

STORET RETRIEVAL DATE 75/10/23

172603
39 14 02.0 089 35 55.0
LAKE LOU YAEGER
17135 ILLINOIS

11 MALES 2111202
3 0009 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/05/12	10	35 0000	18.5		6	235	7.80	62	0.140	0.600	2.220	0.093
	10	35 0005	18.5	9.6		200	7.70	60	0.160	0.600	1.230	0.092
73/08/10	13	05 0000	28.6	6.2	8	215	7.40	64	0.100	0.900	1.640	0.076
	13	05 0005	28.7	6.0		207	7.40	63	0.080	0.700	1.660	0.072
73/10/18	09	50 0000	17.2		18	198	7.60	67	0.080	0.700	0.920	0.075
	09	50 0005	17.2	7.8		199	7.60	65	0.050	0.800	0.900	0.072
	09	50 0010	17.2	8.0		181	7.50	65	0.050	0.800	0.900	0.077

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/05/12	10	35 0000	0.252	
	10	35 0005	0.256	
73/08/10	13	05 0000	0.209	2.4
	13	05 0005	0.166	
73/10/18	09	50 0000	0.158	8.8
	09	50 0005	0.149	
	09	50 0010	0.158	

STORET RETRIEVAL DATE 75/10/23

172604
39 15 30.0 089 35 20.0
LAKE LOU YAEGER
17135 ILLINOIS

11EPALES
3

2111202
0012 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/05/12	10 55	0000	19.1		6	340	7.60	88	0.310	1.300	3.600	0.138
	10 55	0004	18.5	5.8		300	7.60	78	0.330	0.900	3.240	0.139
	10 55	0008	18.4	7.8		235	7.80	79	0.330	0.900	2.830	0.135
73/08/10	12 50	0000	27.0	5.2	8	238	7.40	77	0.180	1.200	1.180	0.046
	12 50	0007	26.7	4.6		237	8.20	76	0.210	1.100	1.130	0.035
73/10/18	09 33	0000	16.0		18	290	7.90	109	0.060	0.800	1.690	0.055
	09 33	0006	15.8	8.0		310	7.80	121	0.080	0.900	1.920	0.067

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/05/12	10 55	0000	0.278	
	10 55	0004	0.334	
	10 55	0008	0.317	
73/08/10	12 50	0000	0.226	46.7
	12 50	0007	0.181	
73/10/18	09 33	0000	0.157	16.2
	09 33	0006	0.172	

APPENDIX E

TRIBUTARY DATA

STORET RETRIEVAL DATE 75/10/23

1726A1
39 11 15.0 089 36 15.0
W FORK SHOAL CR
17097 MONTGOMERY CO MA
O/LAKE LOU YAEGER
SEC RD BRDG JUST DOWNSTREAM OF DAM
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/06/02	09 40		1.580	3.360	0.120	0.140	0.300
73/07/08	09 30		1.200	2.700	0.046	0.105	0.290
73/08/04	13 20		1.380	1.890	0.120	0.110	0.210
73/09/08	11 30		0.850	0.780	0.110	0.090	0.165
73/10/13	13 00		0.760	0.750	0.092	0.069	0.163
73/11/04	11 20		0.850	0.900	0.013	0.058	0.155
73/12/02	08 00		0.750	0.800	0.040	0.040	0.085
74/01/05	09 25		1.520	1.000	0.092	0.092	0.130
74/02/17	09 00		2.640	1.100	0.140	0.190	0.220
74/03/02	09 50		2.600	1.800	0.210	0.160	0.380
74/03/16	19 15		2.800	2.200	0.180	0.145	0.405
74/04/06	07 15		2.300	3.700		0.150	0.420
74/05/05	10 30		2.100	1.100	0.130	0.085	0.300

STORET RETRIEVAL DATE 75/10/23

1726A2
39 17 10.0 089 34 15.0
W FORK SHOAL CR
17 MONTGOMERY CO MA
T/LAKE LOU YAEGER
SEC RD BRDG 2 MI S OF RAYMOND
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/06/02	10	50	6.300	3.570	0.176	0.260	0.420
73/07/08	10	50	3.600	1.600	0.072	0.190	0.270
73/08/04	13	40	3.400	1.600	0.198	0.231	0.342
73/09/08	12	45	0.640	3.600	0.260	0.580	1.500
73/10/13	13	30	2.700	2.100	0.285	0.390	0.660
73/11/04	12	20	4.000	0.850	0.252	0.336	0.480
73/12/02	08	27	5.000	1.200	0.252	0.148	0.230
74/01/05	10	07	6.300	0.500	0.116	0.086	0.175
74/02/17	09	30	5.880	1.200	0.230	0.130	0.135
74/03/02	10	15	5.000	1.100	0.105	0.080	0.190
74/03/16	20	15	6.700	0.700	0.065	0.085	0.175
74/04/06	08	15	4.300	0.600	0.040	0.080	0.135
74/05/05	11	15	5.400	0.900	0.210	0.210	0.330

STORET RETRIEVAL DATE 75/10/23

1726B1
39 16 10.0 089 36 15.0
THREE MILE BRANCH
17 MONTGOMERY CO MA
T/LAKE LOU YAEGER
SEC RD BRDG 1 MI DOWNSTREAM FIVE MILE DA
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/06/02	10 45		1.000	4.450	0.081	0.017	0.115
73/07/08	10 00		1.700	2.800	0.080	0.080	0.220
73/08/04	13 35		0.720	1.540	0.105	0.089	0.200
73/09/08	12 30		0.132	1.680	0.315	0.069	0.220
73/10/13	13 15		1.020	2.100	0.210	0.078	0.180
73/11/04	12 50		0.570	1.100	0.021	0.021	0.130
73/12/02	08 15		2.800	1.300	0.184	0.240	0.400
74/01/05	10 00		3.520	0.900	0.176	0.100	0.170
74/02/17	09 15		2.520	1.100	0.210	0.065	0.070
74/03/02	10 00		1.120	2.000	0.220	0.135	0.345
74/03/16	20 00		1.400	3.500	0.110	0.120	0.910
74/04/06	08 00		1.280	4.000	0.120	0.120	0.945
74/05/05	11 00		1.850	1.100	0.120	0.032	0.145

STORET RETRIEVAL DATE 75/10/23

1726C1
39 16 20.0 089 33 00.0
BLUE GRASS CR
17 MONTGOMERY CO MA
T/LAKE LOU YAEGER
HWY 127 BRDG 2.8 MI SSE OF RAYMOND
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/06/02	11 10		7.400	2.000	0.120	0.066	0.170
73/07/08	11 00		9.300	1.800	0.105	0.072	0.145
73/08/04	13 50		4.300	3.400	0.120	0.097	0.155
73/09/08	13 00		1.180	2.500	0.273	0.270	0.560
73/10/13	13 45		5.100	1.470	0.105	0.132	0.260
73/11/04	13 00		5.800	0.100K	0.030	0.085	0.135
73/12/02	08 44		6.300	0.500	0.044	0.076	0.120
74/01/05	10 20		6.900	0.500	0.200	0.052	0.070
74/02/17	09 45		6.300	1.300	0.090	0.050	0.050
74/03/02	10 30		6.300	1.100	0.110	0.075	0.170
74/03/16	20 30		6.800	0.900	0.045	0.075	0.200
74/04/06	08 30		6.200	0.800	0.045	0.075	0.150
74/05/05	11 30		5.600	0.600	0.085	0.051	0.115

A VALUE PREFIX TO ME
LESS THAN INDICATED

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